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ABSTRACT

This paper explains how ideas were exchanged between Americans and Europeans during a conference held by the Committee on Architecture for Education. The subject was the future of school design, including the shape of the school and the way that changing educational methods are affecting school buildings. Case studies presented during the conference were: "Open and Flexible Spaces"; "Designing a Place for Problem Solving: The Center for Applied Technology and Career Exploration"; Designing for the Unknown"; "School Size and Quality: What Does This Mean for the Future"; "Creating a Building Design for an Integrated Approach to Teaching and Learning"; "The School as a Building for Lifelong Learning"; "Concept Development as the Key to Innovative Accommodation"; and "Mapping Physical and Virtual Learning Environments." The highlighted workshops explored six themes in school design: location, space, time, scale, cost, and context. Participants were challenged to consider the effects of these specific elements within the design process. (GR)

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Innovative Alternatives in Learning Environments: CAE Fall Conference Proceedings

Sara Malone

The Committee on Architecture for Education spent November 7 – 10, 2000, in Amsterdam exchanging ideas with the Europeans about the future of school design. *Innovative Alternatives in Learning Environments* didn't limit itself merely to the shape of the school—it delved into how educational methods are changing and how they are affecting buildings.

Speakers from Europe and the U.S. discussed the importance of project-based learning in designing their schools. This teaching method requires flexible space to accommodate a variety of class and group sizes, as well as niches for students to learn on their own. Technology, and the need for both computer labs and access within classrooms, is also affecting school design in Europe.

Project-based learning is moving to the forefront in the U.S. as well. For example, Alpha High School in Portland has taken flexibility to a new level, with walls that can be moved throughout the day to accommodate a variety of projects and student groups.

In addition, both European and American schools are forging closer ties to their communities. As participants learned on the tours, The Netherlands has taken this directive literally by building schools above stores in city shopping districts and at the base levels of residential complexes.

The conference breakout workshops effectively explored six themes in school design—location, space, time, scale, cost, and context—and required participants to consider the effects of these specific elements within the design process. After meeting three times, each workshop group presented its findings and ideas to other attendees.

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Part I: Lectures

Keynote Address

Herman Hertzberger

Today, supporting kids through space is the underlying focus of school architects. In the 19th century, children sat together in a room facing a blackboard and a teacher. In the early 20th century, open-air schools were introduced, but children still sat facing the teacher. It wasn't until the second half of the 20th century that this arrangement began to change.

The purpose of schools is no longer to simply acquire knowledge and skills—today's students are there to acquire understanding as well. Students learn how to learn; they learn about attitudes, behavior, and communication.

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Herman Hertzberger was a pioneer in creating a space that allowed students to learn and to understand. In the early 1960s he designed the Montessori School in Delft, a true groundbreaker at that time. It is composed of a conglomeration of small houses, with the hall acting as a street.

"Schools should not be defined objects," cautioned Hertzberger, "because whatever we do, it will change." Flexibility, in the sense of future expansion or reuse, is essential. The Montessori school, for example, was once an office building.

In the 1980s, Hertzberger designed the Apollo School, a combination of two different schools with two different educational systems. He organized all the classrooms around an internal space, an amphitheater-

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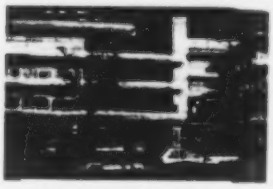
like organization that has been wholeheartedly emulated since. There are smaller corridors and blocked-out areas that allow students to work outside the classrooms.

The 1990s were a time of shrinking budgets for school construction in the Netherlands, said Hertzberger. To stretch the money, he spent it on creating cohesive organization. This tactic was also a response to the wave of immigration: by organizing space well, students of all languages and levels of understanding could feel comfortable.



Herman Hertzberger
Monessori School Ost

These days, noted Hertzberger, many school innovations are found in the U.S. However, the Netherlands is incorporating schools and communities in ways that the U.S. should consider. The lack of open space has forced the country to combine schools with other functions.

Learning at the Margins: Implications for Designing Learning Environments
Dr. George Copa, Oregon State University

Schools' long lives require buildings that meet the demands of the future, said George Copa. We can't just consider what we'll need over the next 10 years; we need a building that will be functional in 2050. It is also important for school administrators to maintain the facility properly, to begin necessary renewal programs while the school is at its peak, not after it has begun its decline.

Copa discussed schools in terms of the six workshop themes that were offered at the Amsterdam conference: context, location, space, time, scale, and cost.

Context
Learning methods and situations are many and varied. There is the typical academic context, which offers a fixed curriculum. There is also the more innovative context, through which people learn by doing. Such learning can occur within a school, or within the community, workplace, or family life. It is in these outside venues that people learn the most and are able to integrate learning of mind, body, and spirit. A school that embraces this concept is the Skagit Valley College in Mt. Vernon, Wash.

Location
Learning is very concentrated in classrooms and labs, Copa said. This is not how it should be; learning should be a decentralized process that takes place everywhere. Copa listed some schools that were built around this principal: Southwestern Oregon Community College; the School of Environmental Studies in Apple Valley, Minn.; San Diego Community College.

Space
Schoolrooms typically are specialized: classrooms, labs, libraries, playing fields, all are clearly separated. A more innovative approach, said Copa, is to create mixed-use spaces. For example, the Advanced Technical Center in Colorado is based on the principle that learning can take place anywhere and, therefore, the classroom can also be the home, library, etc.

Time
Classes normally are held five days a week, nine months a year, one hour per class period. Copa suggests that students learn better when they're not forced into such rigid schedules. Instead, allowing them to do as much as they need when they want to, and spreading out the time barriers to that of a lifetime is a far more effective method. Kapolei High School in Honolulu is one school that follows that idea.

Scale
Most schools have a campus divided into programs, departments, or colleges, with the idea that bigger is better. Not so, said Copa. Students learn better when they are treated as individuals and are able to be part of smaller groups, say five to seven people. Schools that have adopted this concept include the School of Environmental Studies in Apple Valley, Minn., and the Kapolei High School in Honolulu.

Cost
Costs should not be broken down per student, said Copa. The emphasis instead should be on sustainability and effectiveness, on forging alliances and partnerships, and on viewing students as customers. Examples can be found at the San Diego Community College and the Hong Kong Institute of Vocation Education.

The big lesson, said Copa, is that strong architecture, strong community, and strong learning all are intertwined and must have thoughtful and graceful connections.

Architects should design for coherence, taking into account elements such as organization, partnerships, technology, finance, and future expectations. As we move deeper into the 21st century we should turn our attention toward building smaller schools, creating a global clearinghouse, boosting public awareness, networking, and experimenting.

Case Study 1: Open and Flexible Learning Spaces
Reino Tapaninen

In Finland, as elsewhere in the world, there is too much emphasis on classrooms. However, said Reino Tapaninen, pedagogy is moving its focus to student-centered learning. Learning no longer is bound to time and place and groups are much smaller. Technology has greatly supported these changes.

While many activities are now decentralized--from learning to banking--people still need a place where they can interact and bond.

This is true particularly in schools, noted Tapaninen, as he outlined three examples of innovative schools in Finland: Kiihtelysvaara; Kuokkala Upper Level School and Regional Central Kitchen, Jyväskylä; Riihenmäki Upper Level School, Mäntsälä, and Heinävaara School.

Kuokkala Upper Level School and Regional Central Kitchen, Jyväskylä
Built in 1994, Kuokkala was designed around the concept of openness, project work, and knowledge acquisition. At the entrance is a place for bikes, while its arms embrace all comers. The main lobby, a place where everyone can gather, is decorated with art from the workshops. Also, a big rock serves as a dais, tying the building to its surroundings.

Riihenmäki Upper Level School, Mäntsälä
The center of Riihenmaki is a square, with an auditorium behind it that can further expand the space when opened. The entrance of the building is a long, welcoming shelter, while the lobby has a sunken area for both recreation and learning. The entire building is imbued with a sense of transparency: teachers can meet in an open kiosk-like space, and windows are abundant.

Heinävaara School, Kiihtelysvaara
Some teachers from the Heinavaara School visited several facilities with open plans in Minneapolis whose examples they wished to follow. Heinavaara was designed around the concepts of flexibility, versatility, variability, and hominess. There are eight homebases, but no partition walls; some classes—such as music and handicrafts—are closed off to buffer noise. The school is in a remote area with a very harsh climate. It attempts, therefore, to reach beyond the students to the community at large. The school also was careful to follow the Finish village house vernacular to create an intimate scale.

Case Study 2: Designing a Place for Problem Solving: The Center for Applied Technology and Career Exploration
Daniel Duke, EdD

At the Thomas Jefferson Center for Educational Design at the University of Virginia (http://curry.edschool.virginia.edu/curry/centers/jefferson/), designers have three missions: To identify and challenge sacred assumption, explore and evaluate possibilities, and think systematically.

Daniel Duke said there are eight assumptions about teaching and learning:
1. Central activity is teaching
2. The focus is the acquisition (not application) of knowledge
3. Students must be graded on performance
4. All students should have the same basic knowledge
5. All students should acquire knowledge in the same amount of time
6. All students should learn things in the same sequence
7. All students must acquire knowledge in the same space
8. All students must be under one roof.

He indicated that there are several schools that break from these assumptions. Among these schools is the Center for Applied Technology and Career Exploration in Franklin County, Va. Franklin County, located in a very rural area with a per capita income of $15,695 and a 40 percent rate of adults without high school diplomas.

The county wanted a new middle school, but the taxpayers approved only $7 million of the $14 million needed to build the facility. The school system responded by building a school that is used only half of the year, while the old facility is used the other half of the year.

Eighth grade is a critical juncture for dropouts, said Duke, and the designers and administrators weighed this factor heavily in the new building. Not only does it not look or feel like a school, but there are no bells, classrooms, or courses. The school has an electronic library, one computer per two students, workstations, commons, and a conference center. It does not have desks, a cafeteria, a gym, or lockers in the halls.

Students select three six-week modules, which include such subjects as environment, arts, manufacturing, legal science, or human services. Two people team up to lead each module, one a teacher the other a member of that field. The teachers and the 30 students present a problem, and the students resolve it during the six weeks. They then present their solutions to the board of supervisors, who must act on it. This approach not only gives students hands-on experience, it also allows them to give back something to the community.

Case Study 3: Designing for the Unknown
Norman Dull, AIA

Anticipating future needs is a daunting task, said Norman Dull, and the key is to be flexible. He offered examples of two facilities that did just that: Alpha High School in Gresham, Ore.; and Southridge High School in Beaverton, Ore.

Alpha High School
Alpha is an alternative school that offers individually tailored training, diverse experience in the work world, and positive self-development and aims to help students determine future careers as they earn their diplomas.

Students spend half of each day in classroom settings. They spend the other half of the day in job experience settings, be it onsite, in a business lab, or in a school-to-work program.

The school itself is in an urban setting, a block away from the train station. The 16,000-square-foot facility was designed specifically to house these programs. One of Alpha's key design mandates was that it not look like a school.

Administrators were also adamant that the facility be flexible. Teachers use mobile carts as desks rather than being confined to a single room, but most useful of all are the movable walls and furniture that allow the staff and students to adjust the rooms to their needs.

So far, Alpha High School has a very impressive record: 100 percent of the students have graduated, 97 percent are employed, there is a 95 percent attendance rate, and a 78 percent retention rate.

Southridge High School
The school's site was purchased 20 years ago, and the area around it grew tremendously in the meantime. When designers tackled this project they were given the task of creating a lifelong learning and wellness center with a public library, 600-seat auditorium, dance floor, community room, and community police office.

The building has student "streets" instead of halls, with porches serving as entries to each neighborhood. Each neighborhood—a zone with a student area, a parent area, and a production area—serves 450 to 500 students. There are common offices for teachers, with private counseling areas in the back.

The common themes, said Dull, are community, lifelong learning, safety, integration, smallness, collaboration, and flexibility.

Case Study 4: School Size and Quality—What Does This Mean for the Future?
Joe Nathan, PhD

Research on schools has proven that smaller is better, said Joe Nathan; that means smaller student to teacher ratios and smaller schools. The Lee and Smith study, among others, has demonstrated that the notion of economies of scale that prompt so many communities to build enormous 3,000-student high schools is a fallacy. The benefits found in more personal and intimate learning environments far outweigh the limited efficiencies of megaschools.

For starters, smaller facilities have less violence, higher standardized test scores, and higher rates of graduation.

While school and classroom sizes are critical elements, they are only part of the puzzle. Community involvement is also important, and it is necessary to keep this idea in mind when designing schools.

It is possible, said Nathan, to design effective small schools that are not outrageously expensive, that tie into the community, and that have long, productive afterlives. It is also possible to turn an existing facility into a very good school.

In Buffalo, N.Y., the King Urban Life Center, which once was a church, is a school for pre-K through second grade. The space is flexible to house various student and community activities, and well-placed dropped light fixtures have given the interior a more intimate feel while leaving the former church's soaring ceilings as a background note.

In Minnesota, the Northfield Community Resource Center houses a variety of services: a school called the Area Learning Center, Head Start, a thrift store, and a senior center. The 58,000-square-foot building has 4 wings and 84 rooms, including an exercise room and 8 conference rooms.

Examples such as these offer promising strategies for the future.

Case Study 5: Creating a Building Design for an Integrated Approach to Teaching and Learning
Dan Bodette

The School of Environmental Studies in Apple Valley, Minn., has successfully integrated design with an innovative curriculum. The school is one of 13 named by the U.S. Department of Education as a new American High School (http://www.ed.gov/offices/OVAE/nahs/video/).

The school's culture shaped the design of the facility. There are four integrated academic houses, with 100 students per house. Each house is divided into 10 pods, housing individual and teamed efforts.

A centrum within each house can hold all the students at once. Pods are located along the sides of the centrum, and each house incorporates a science lab and seminar space. The students each have their own workstation, but they also work on their own time outside the school.

The classes are theme based; students and teachers take a theme and develop a universal question that in turn drives their curriculum, offers a variety of possible answers, leads to more questions, uses a wealth of resources, and can be measured in relevant tasks. The students also partner with local businesses and groups.

In addition to the theme classes, students have Socratic seminars, which encompass school-wide involvement; foundation skills, which include group processing and research; and inquiry and discovery, which involves problem solving.

Such a curriculum allows students to interact more closely with their community and adds greater meaning to their lessons. In turn, many students are less stressed as they advance to the next stage in their lives.

Case Study 6: The School as a Building for Lifelong Learning
Jaap F. Westbroek

Most schools are designed for 30 years of use, said Jaap Westbroek. During that time, there inevitably will be a new learning concept. The trick, he noted, is to create a building that can be adapted, which means learning to think of the future in a non-linear way.

We are currently in the midst of a paradigm shift; not a revolution, simply a growth of the old language to include new concepts. The new paradigm is a bigger circle with the same center. The shift has to do with the struggle on the edge of the smaller circle, the finding of new words and new grammar.

Just at the moment of shift from one paradigm to another, both are true and everything appears as a paradox. In a knowledge society, paradigms shift continuously, which is why creativity will be so important.

In the past, school architecture has been internally focused, shaped by societal organization. Today the shift is toward informal learning. Therefore, architects can help both teachers and students to be more creative by giving them well-designed space.

What is the old paradigm of school architecture? The process of normalization is hierarchical organization, i.e., what is normal is shown at the top. Architecture is similar. The process of normalization is anti-hierarchical organization.

For people to be normal in a knowledge society we need:

- A new relation between the inside and the outside
- A new relation between doing and thinking
- Much room for creativity and the unexpected
- Safety and rest.

The paradigm shift, concluded Westbroek, is that we are moving from mass education to on-demand education; from periods of learning to lifelong learning; and from the edge to the center of the economy.

Case Study 7: Concept Development as the Key to Innovative Accommodation
Gert Jan Meijer

The Knowledge Center at Albeda College in Rotterdam, The Netherlands, is a new accommodation concept that brought together two main participants: the Albeda College and the House of Entrepreneurs. According to Gert Jan Meijer, bringing together these groups (along with other, less involved groups) necessitated careful discussions and planning to ensure that ambitions, goals, and activities were matched and met.

The Knowledge Center, set in a redevelopment area that is home to many immigrants, aims to bridge to information and formal education for adults. It also is intended to forge a strong relationship among the residents and the businesses located nearby.

Albeda College and the House of Entrepreneurs had a variety of requests for the new space. They wanted room for lectures, meetings, an Internet café, and class space, all of which had to be squeezed into 130 square meters.

Within the space is mobile furniture and computers, which can be moved behind screens for larger activities like lectures. The space itself is simple, warm, and relaxing. In addition, it has a business-like rather than a school-like atmosphere.

Case Study 8: Mapping Physical and Virtual Learning Environments
Susan Steubing

Mapping is a "powerful graphic communication tool" that has been adapted by Twynstra Group's Learning Environments team (http://www.learnring.com/), explained Susan Steubing. Learning Environments has worked with a variety of organizations, including ministries of education and universities, to create maps that help simplify complex ideas.

When developing a map, you must first identify the driving forces and the key stakeholders. Maps are useful for a variety of reasons, Steubing said:

- Complex and nonlinear change
- Many stakeholders
- Stakeholders have different world views and descriptions
- Buy-in is crucial
- Communication process
- Need to clarify and test concepts
- Tool for leadership.

Kennisnet is one example of a mapped learning environment. It is a $500 million Dutch project with member-generated content and 30 active communities.

Glasgow also adapted the concept with its Glasgow Learning City Concept. The city wanted to offer community-based lifelong learning, reach out to the economically disenfranchised, and enhance economic development. During the design phase, the city also realized it wanted to create an international identity for itself.

Part 2: Workshops

Workshop 1: Location
Jim Dyck
Cees Willems

There has been a long-term trend to create places for learning that neglect the other dimensions of life, i.e., the social and the emotional. Participants in the Location Workshop discussed how learning takes place within a community. In the old, "citadel" model, learning takes place in preordained locations with set subjects and opportunities.

However, educators have come to realize that learning is the glue of a livable community. The key to offering truly effective learning is access. The location of learning can provide greater opportunity to the community because it affects who is served and what is available.

During the workshop, participants began with the assumption that there was no set formula. They looked for something that was more process oriented. Schools, they determined, are ideal hubs of community learning.

Workshop 2: Space
Jeff Lackney
Elly Reinders
Jan Wagemaker

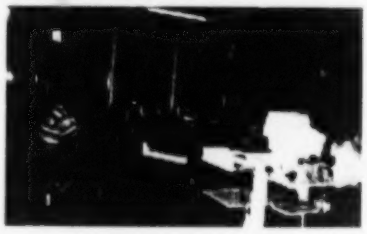
The classroom has been the basic building block of school design and supportive of lecture-style instruction. This focus is shifting as educators realize the benefits of other instruction methods.

Participants of this workshop discussed how learning is more than information gathering and should be more student-centered. They reported that 77 percent of their special moments took place outside of the school.

During the third session of the workshop, participants designed a study house based on criteria such as differentiation, safety, and privacy. Among the solutions were facilities that included a study house and interdisciplinary learning, and facilities that turned the school into a village and offered amenities such as a café and a cinema.

Workshop 3: Time
Hans van Aalst
Prakash Nair

Our educational institutions were conceived from the idea that the learner would be educated to a certain level and then emerge as a productive citizen. In today's rapidly changing world, this static notion is obsolete.



Learning and time are both unlimited, agreed participants, while schooling and time are not. Time deeply influences our school system today: classes run nine months a year, seven hours a day, five days a week. Time is further broken up when bells ring, telling students it is time to change classes.

The external time clocks created by society are at odds with our internal clocks. Project-based learning recognizes this fact and allows students to move at their own pace.

At a timeless school, the teacher becomes a mentor who sets boundaries, while students are responsible for teaching themselves.

Now the school as a physical form is frozen in time. However, it can become an improvisational theater, where its settings can take on many meanings.

Workshop 4: Scale
Pam Loeffelman, AIA

Large schools may have an economy of scale, but studies have proven that these big facilities are ineffective places to learn.

Scale relates people to the places they inhabit. It varies from building to building and from user to user. While size has long been used interchangeably with scale, it is just one characteristic of scale. Scale is also defined by its context, pattern of parts, and syntax.

People have become much more aggressive in defining their own context. To define scale, a project needs to be site specific *and* user specific. Characteristics of scale in schools include connections to the surrounding community, a sense of arrival, a variety of individual and group learning places, and connections between users.

Participants in this workshop agreed that all the questions they asked and answered always led to more questions.

Workshop 5: Cost
Gaylaird Christopher, AIA
Cor van Dalen

Educational institutions require an infusion of resources to stay viable. These resources, already limited, are diminishing in many countries. The stress of constant change is adding to the problem.

To stretch funds as far as possible, the building must be sustainable. Other ways to stretch government dollars is to take advantage of the community functions of a school to ensure that services within a community are not duplicated in the school.

The heart of each local area is a primary school that should be designed as a facility that reaches out to all with its library, indoor and outdoor recreation amenities, daycare, and social services.

Schools can also forge links with the surrounding business community. Businesses can underwrite thematic programs such as energy creation and consumption. They can help establish profit centers within the school, having students run their programs at a much lower cost.

Another method for stretching tight budgets is to create a building with simple materials that could easily be recycled and require little maintenance. Furthermore, the school should be flexible for the students and for future reuse as offices or housing. Or, administrators should be willing to adapt an existing facility as a school.

Workshop 6: Context
Bill Bradley
Lia Burgers

The learning process enables people to be effective in their work, families, and communities. This context, however, is in constant flux. Participants in the Context workshop considered how context could change in the future.

Elements that affect context include:

- Technology—the more we move toward virtual reality, the more we need context
- Violence—it is important to distinguish prisons from schools
- Work and family—lines are blurring
- The global market—multilingual skills will be important, and we will need more vocational education
- Sustainability—in practical applications, the curriculum could integrate more environmental issues
- Multiculturalism—recognize differences and celebrate similarities.

There will also be issues of accountability and liability, and the role of the teacher will have to be redefined.

Part 3: Tours

Tours of educational facilities across the Netherlands, where there is a higher level of community interaction at schools, gave participants the opportunity to study how Dutch architects handle the challenges of school design.

A number of facilities are nestled into residential areas, literally, with apartments located above the schools.

This solution is practical limited space in the country and cuts down on possible security worries. For example, the Lei, in Vleuten de Meern, has housing above it that is occupied primarily by the elderly, who often help out at the school. Schools in settings like these can easily be converted to community recreation centers, and the Dutch design their schools with the thought of future reuse in mind.

Schools in the Netherlands have been integrated into the community in other ways as well. Literally taking the concept of the school as a learning shop, Windroos, a primary school in Deventer, was designed in the shopping district and is located above a store.

Several optional tours were also available. Some participants visited The Hague, where they were given a tour of the Resident, an urban redevelopment initiative that includes Richard Meier's City Hall and Michael Graves' two towers, home to the Ministries of Health, Welfare, and Sport. There was also a tour of University Utrecht, which included a visit to Rem Koolhaas' Educatorium, Neutelings Riedijk Architects' Minnaert building, and the Faculty of Economics and Management designed by Mecanoo.